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THE CROWN-GALL AND HAIRY-ROOT DISEASES OF THE APPLE TREE.

BY

GEORGE G. HEDGCOCK,

ASSISTANT IN PATHOLOGY, MISSISSIPPI VALLEY LABORATORY.

VEGETABLE PATHOLOGICAL AND PHYSIOLOGICAL INVESTIGATIONS.

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CONTENTS.

	Page.
Introduction	5
Two distinct diseases, crown-gall and hairy-root	5
Types of apple crown-gall	6
Effect upon the length of life of the apple tree	6
Suggestions to nurserymen	6
Data desired	7

ILLUSTRATIONS.

		Page.
PLATE I.	Fig. 1.—Apple crown-gall on grafted tree. Fig. 2.—Apple crown-gall on transplanted seedling. Fig. 3.—Hairy-root disease on grafted apple tree. Fig. 4.—Hairy-root disease on grafted apple tree	4
II.	Fig. 1.—Apple seedlings diseased with hairy-root. Fig. 2.—Apple seedlings diseased with soft crown-gall	4
III.	Fig. 1.—Healthy fibrous-rooted apple tree, pot grown. Fig. 2.—Apple seedlings diseased with hairy-root	4

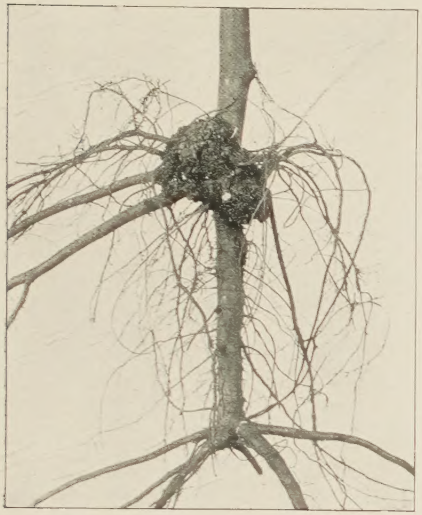

FIG. 1.—APPLE CROWN-GALL ON GRAFTED TREE.

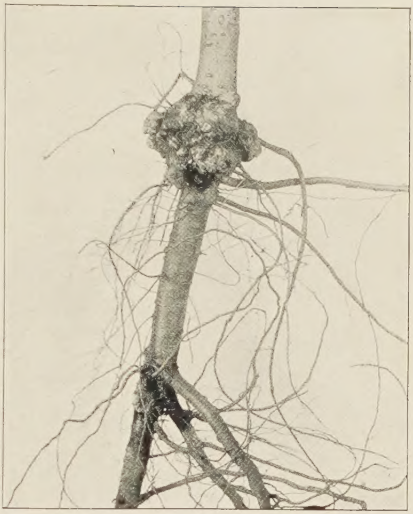

FIG. 2.—APPLE CROWN-GALL ON TRANSPLANTED SEEDLING.

FIG. 3.—HAIRY-ROOT DISEASE ON GRAFTED APPLE TREE.

FIG. 4.—HAIRY-ROOT DISEASE ON GRAFTED APPLE TREE.

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FIG. 1.—APPLE SEEDLINGS DISEASED WITH HAIRY-ROOT.

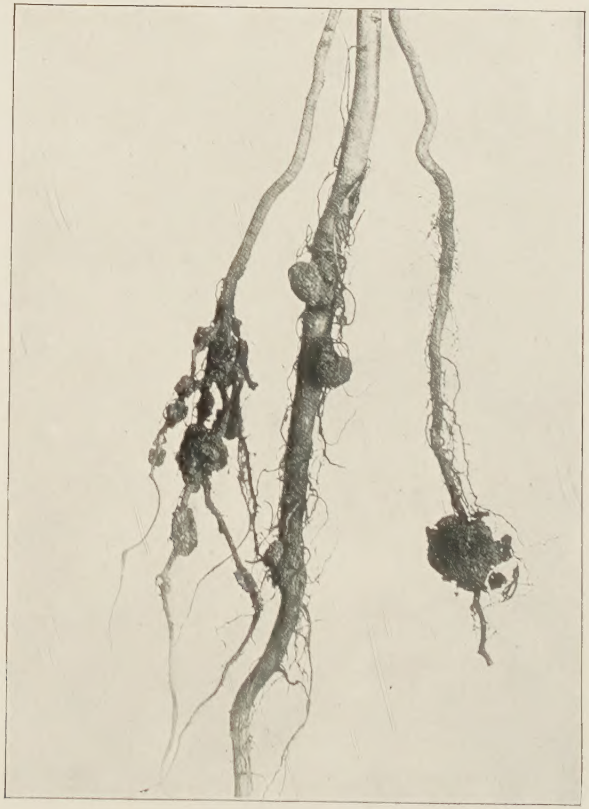

FIG. 2.—APPLE SEEDLINGS DISEASED WITH SOFT CROWN-GALL.

FIG. 1.—HEALTHY FIBROUS-ROOTED APPLE TREE, POT GROWN.

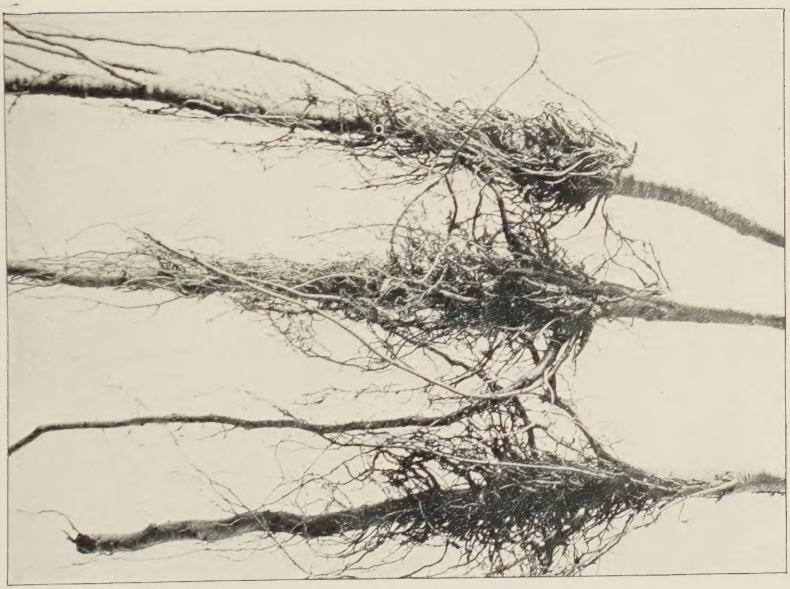

FIG. 2.—APPLE SEEDLINGS DISEASED WITH HAIRY-ROOT.

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THE CROWN-GALL AND HAIRY-ROOT DISEASES OF THE APPLE TREE.

INTRODUCTION.

The diseases of the apple which have been classed under the name crown-gall have, during the last few years, attracted much attention, due partly to an increase of these diseases and partly to the enacting of more stringent State laws governing the shipment and inspection of trees.

A series of investigations into the nature of crown-gall upon the apple, pear, raspberry, peach, almond, grape, rose, and other plants has been in progress for some time in the Mississippi Valley Laboratory of the Bureau of Plant Industry at St. Louis, Mo., and also at other points in the Mississippi Valley. It is not to be assumed, however, that such diseases are more common in this locality than in some other portions of the United States. Apple crown-gall and hairy-root have been found in all nurseries that have been examined in various portions of the country.

This preliminary report is sent out, not with the intention of giving the results of all our investigations, but for the purpose of calling the attention of apple-tree growers to the different diseases hitherto known as apple crown-gall, and to endeavor to interest them in the collection of data regarding the predisposition of varieties to these diseases.

TWO DISTINCT DISEASES, CROWN-GALL AND HAIRY-ROOT.

Our investigations have resulted first in separating apple crown-gall into two diseases, which are considered distinct. The disease now designated as crown-gall is a callous-like gall growth of hypertrophied tissue following wounds on some portion of the root system of the tree, which rarely occurs above the ground on parts of the trunk or limbs. (See Pl. I, figs. 1 and 2.)

The malady now called the hairy-root disease is evidently the same as the one first given this name by Stewart, Rolfs, and Hall in Bulletin 191 of the New York State Experiment Station. It is characterized both in seedlings (Pl. II, fig. 1, and Pl. III, fig. 2) and in grafted or

budded trees (Pl. I, figs. 3 and 4) by a stunted root system, accompanied with an excessive production of small fibrous roots, often originating in clusters from the main root, or taproot. Galls often occur in connection with hairy-root, but these are a result of wounds rather than a form of this disease. Seedlings of the hairy-root type, unless wounded, remain free from galls.

TYPES OF APPLE CROWN-GALL.

Apple crown-gall is of two types. A hard callous form is common on grafted trees at the union of the root and scion, and at any other point of the root system where wounds occur in either the cultivation or transplanting of trees (Pl. I, fig. 1). The results of extensive inoculations with this type have failed to prove that this disease is of a contagious nature.

A second type is a soft form more common on seedlings (Pl. II, fig. 2), occurring more rarely on grafted trees (Pl. I, fig. 2). These softer galls resemble those of the raspberry and peach, in that they are soft and often rot off. It is not certain, however, that they, like the latter, are replaced the following year by a new gall growth from the adjacent live tissues of the host, nor is there proof yet that they are of a contagious nature.

EFFECT UPON THE LENGTH OF LIFE OF THE APPLE TREE.

Careful data are being collected from orchards and nurseries as to the effect of these diseases upon the life and fruitfulness of trees. Any information as to the locality of orchards in which diseased trees have been planted will be highly appreciated. In our crown-gall orchard there are more than 200 trees diseased with the hard type of crown-gall, and 200 healthy trees of the same grade planted under similar conditions. After two years' growth six of the crown-gall trees and nine of the healthy ones have died. No difference in the growth of the trees is noticeable. However, it can not be assumed from the results so far that, on the one hand, the disease may not yet shorten the life of the trees, or, on the other, that the trees may not entirely overcome its effects. A tree having crown-gall on its roots, however, can never be correctly graded with a smooth-rooted tree. The root system of a healthy fibrous-rooted apple tree is shown in Plate III, figure 1.

SUGGESTIONS TO NURSERYMEN.

Nurserymen are advised to be careful in the selection of seedlings for grafting and budding. All rough, warty, or galled seedlings should be thrown out, for most of them will form rough-rooted trees. Seedlings with tufted or hairy roots should also be rejected, for these,

as shown by our experiments, develop into hairy-rooted trees with a very deficient root system. The hairy-root disease, as it appears from the results of two years' experiments, is not contagious. It is hoped in the near future to be able to offer some practical means of reducing the percentage of trees affected with these diseases in the nursery.

DATA DESIRED.

The hearty cooperation of nurserymen and orchardists in securing data is desired. It is hoped to secure the help of the leading nurserymen of this country in getting an accurate count from each nursery of the number of diseased trees in at least one row of every variety in all fields where the trees are all dug in one season. Such data are desired from every locality where apple trees are grown. Printed blanks with directions for tabulating such data have been provided and these will be sent to all who request them. Address the Mississippi Valley Laboratory, St. Louis, Mo.